PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION
423 U. S. Court House
Portland 5, Oregon

Division of Flood Control Surveys

RIFC-NW
LOCAL FLOODS
Southern Oregon

January 10, 1951

FLOODS OF OCTOBER 1950 IN SOUTHERN OREGON

Newspaper headlines October 29 and 30 proclaimed devastating floods in northwestern California and southwestern Oregon. These floods developed from heavy rains accompanying the storms of October 26 to November 2. In one or two cases, flood peaks reached were the highest of record. The area affected extended from the Eel River in California north to the Siuslaw River and southern Willamette River tributaries in Oregon. Del Norte, Humboldt, and Siskiyou counties in California; and Curry, Josephine, Jackson, Douglas, Coos, and Lane counties in Oregon were the hardest hit.

Highest flows and most damage occurred in the South Umpqua River, in the Umpqua tributaries Myrtle Creek, Deer Creek, Sutherlin Creek, and Cooper Creek; in the Coquille River; in the Smith River; and in the Illinois and Applegate Rivers tributary to the Rogue River. These streams rose rapidly to high peaks, without much warning. Continued rains from the middle of October had brought streams up somewhat, then the heavy rains of October 27 to 29 pushed them up sharply to full flood. Peaks on most streams within the affected area were reached on October 29; though on those nearest the coast, peaks occurred late on October 28.

Flood Occurrences

The table following shows the levels reached by the various major streams in the area of greatest flooding. Gaging stations on some streams were torn out by the flood, so that figures given are estimates in those cases.

Table 1. Flood Peaks, Storm of October 27-30, 1950

Stream	Station	Drainage Area (sq. mi.)	Flood Stage (feet)	Crest Height (feet)	Peak Discharge (cfs)	Date	
						day	hour
(California)							
Trinity River	Lewiston			21.0	39,300	10/30	
Smith River				*(highest since 1890)		10/29	
(Oregon)							
Illinois River	Kerby	367		* 24.8	39,400	10/28	late p.m.
S. Fk. Coquille R.	Powers	169		18.2	22,520	"	
Rogue R.	Grants Pass			21.2	60,500	10/29	2:00 p.m.
S. Umpqua R.	Winston	1640		32.4	81,500	"	
Umpqua R.	Elkton	3680		44.3	191,000	10/30	1:00 a.m.
Mid. Fk. Willamette R.	Lowell	994		12.9	48,000	10/29	6:00 a.m.
Willamette R.	Eugene		12.0	15.9	107,000	"	5:00 p.m.
Willamette R.	Corvallis		20.0	25.1	117,900	10/30	7:00 p.m.
Willamette R.	Salem	7280	20.0	21.1	159,000	11/1	12:30 a.m.
McKenzie R.	Leaburg			18.5		10/29	7:00 a.m.
Calapooya R.	Holley	99	10.5	9.3	5,870	"	8:00 a.m.
N. Santiam R.	Detroit Dam	438		13.3	16,300	"	4:30 a.m.
N. Santiam R.	Detroit Dam	438		15.8	31,000	11/2	2:30 a.m.

* Estimated, gage lost

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Flood Occurrences

The table following shows the levels reached by the various major streams in the area of greatest flooding. Gaging stations on some streams were torn out by the flood, so that figures given are estimates in those cases.

Flood peaks for streams of the southern Willamette drainage are estimated to represent about a 5- to 10-year frequency. On the South Umpqua River, however, the flood frequency is estimated to represent a much rarer peak. Tributaries, including Cow Creek and Myrtle Creek, hit peaks estimated at a foot above those recorded for the 1927 flood, and in Myrtle Creek above those for the 1890 flood. Sutherlin Creek and Cooper Creek, tributary to the North Umpqua, were also said to have reached flood crests greater than any previously recorded. The main Umpqua River at Elkton hit a peak only a foot below that reached in 1861. The Rogue River, though high, apparently did not have any serious flooding. But two large tributaries, the Applegate River and the Illinois River, reached high levels and did considerable damage. Several creeks flowing into these two streams showed discharge rates from 100 to nearly 300 cfs per square mile of drainage area. The Coquille River, though it did not reach as high a peak relative to other streams of the area, acted most spectacularly and caused considerable damage. The Geological Survey is now making channel section measurements toward determining flood peaks on streams not gaged; this additional information should be available soon.

Only in the Coquille was sediment measured on the rise toward the flood peak. The load carried amounted to 3.8 percent by weight when the river was flowing more than 20,000 cfs. One day after the flood crest, with the stream flowing less than half the peak, sediment carried in the South Umpqua amounted to 0.7 percent. The Willamette at Portland carried only 0.02 percent at peak. Other streams measured during the days immediately after the peak carried from 0.01 to 0.2 percent sediment. It is estimated that on the Coquille alone some five million tons of sediment were flushed out on the peak day. This is the equivalent of two feet of soil from a section of land.

Storm and Flood Damages

Most of the direct flood damage consisted of loss of roads and bridges, and interruptions to transportation and communications. The State engineer was reported as saying the road damage was the worst in the history of the State. Road damage in Douglas County, Oregon was estimated at $200,000; in Josephine county, at $100,000. A railroad bridge over the Willamette was washed out near Eugene. The towns of Myrtle Creek, Riddle, Canyonville, Eugene, Sutherlin, Roseburg, and Grants Pass suffered inundation in some sections. Recent increases in population and in the development of bottomlands subject to flooding are factors in the extensive damage suffered.

Six persons lost their lives in the storm; five from accidents attributable to the flood. About two thousand were forced to move from their homes; and lost clothing, furniture, bedding, and household goods.

Flood waters rose to the window levels in many homes. Silt content of the flooding streams spoiled municipal water supplies at Myrtle Creek and other communities.

Considerable areas of farmland were inundated in all the valleys, with some damaging deposition and erosion by bank-caving. In the Eugene area, flood losses of all types of farms were estimated at $30,000. In the Coquille valley, such losses ran very high. The Corps of Engineers are making a flood damage survey, but their report will not be available for awhile yet. Flood damages for the national forests are estimated at $5,000 on the Willamette, $10,000 on the Umpqua, $7,000 on the Rogue River, and between $125,000 and $150,000 on the Siskiyou.

High winds extended over a much wider area than was subjected to flooding, and did damage over much of the Northwest. On the national forests, serious timber losses by blowdown were incurred in some areas. Power and communication lines were cut in many areas. (The new Narrows Bridge at Tacoma, however, stayed in place this time.) Lumber piles and farm outbuildings were blown over, and in several towns numbers of windows were blown out.

Meteorological Background

Rain fell for several days before October 27, two inches or more being recorded at most stations, so that the watersheds were wet. Rainfall increased in intensity during the afternoon of the 27th. Watersheds soon became saturated, and streams began rising rapidly. Rain continued to fall at moderate to heavy rates until the morning of the 29th. Recording rain-gage charts show continuous rainfall from noon the 27th until the afternoon of the 29th at most stations. Maximum hourly intensities recorded ranged from one-quarter inch to a little more than one inch; with the average just under one-half inch. Maximum two-day rainfall exceeded nine inches at half a dozen stations, reaching a high above twelve inches at four of them. One report from a station in the Smith River watershed showed more than ten inches of rain in 24 hours, and more than twenty inches for the period October 27 to 30, inclusive.

There was no accumulation of snow in the mountains, at least below the 6000-foot level, before the period of heavy rain. Small amounts of snow were added by the storm down to the 4700-foot level by the 29th, and most of this remained on the 31st. The freezing level was near 7000 feet during most of the storm, rising from about 5000 feet on the 27th. There was no appreciable contribution to the floods from a melting snow pack.

Table 2. Precipitation, Storm of October 27-30, 1950

All data in inches

Station	Date				Total	Max. Hourly Rate
	27	28	29	30		
OREGON						
Willamette drainage						
Black Butte	1.45	2.25	4.56	1.34	9.60	----
Cottage Grove	1.83	2.81	2.97	0.35	7.96	----
Detroit	1.44	2.25	3.36	1.05	8.10	----
Lowell	0.71	3.15	3.24	0.32	7.42	----
Oakridge R. S.	0.99	(7.30)		0.42	8.71	0.40
Valsetz	3.30	1.70	0.29	1.10	6.39	----
Wicopee	0.98	2.20	4.60	1.70	9.48	----
Willamette Snow Lab.	2.08	5.12	2.73	0.83	10.76	----
Umpqua drainage						
Elkton	2.31	2.55	2.69	1.05	8.60	----
Roseburg	0.56	2.92	3.53	0.14	7.15	0.31
Rogue drainage						
Ashland	0.73	1.55	1.36	0.10	3.74	----
Butte Falls	2.38	3.30	2.18	0.43	8.29	----
Fish Lake	0.43	1.88	0.68	0.93	3.92	----
Grants Pass	0.87	4.09	5.27	0.21	10.44	----
Lake Creek	0.57	2.76	1.55	0.28	5.16	----
Medford Expt. Sta.	0.73	2.94	2.76	0.31	6.74	----
Modoc Orchard	0.37	3.03	2.96	0.57	6.93	----
Persist	0.58	4.78	3.02	0.66	9.04	0.30
Prospect	1.32	3.84	2.73	0.64	8.53	----
Sexton Summit	1.79	4.22	3.04	0.14	9.19	0.37
Williams	1.70	3.97	3.64	1.20	10.51	----
Illinois drainage						
Cave Junction R. S.	1.89	6.71	3.22	1.37	13.19	----
Illahe	3.04	5.42	4.68	0.91	14.05	0.45
Kerby	3.67	6.55	3.74	0.42	14.38	0.87
Coquille drainage						
China Flat R. S.	4.35	5.57	4.24	0.98	15.14	----
Coquille	1.10	2.03	3.76	0.63	7.52	----
Powers	1.80	3.76	4.10	0.62	10.28	----
Sitkum	1.75	3.65	3.90	0.76	10.06	----

Table 2. Precipitation, Storm of October 27-30, 1950 (Continued)

All data in inches

Station	Date				Total	Max. Hourly Rate
	27	28	29	30		
Coastal						
Allegany	1.66	4.14	1.90	1.45	9.15	0.65
Bandon	1.11	2.36	2.02	0.56	6.05	0.32
Brookings	2.00	3.74	4.68	0.24	10.66	----
Reedsport	1.32	3.30	1.52	1.01	7.15	----
Interior						
Chemult	1.30	2.00	0.40	0.30	4.00	----
Crater Lake	1.00	5.17	2.42	0.96	9.55	----
CALIFORNIA						
Coastal						
Crescent City	2.80	5.17	4.29	0.04	12.30	0.80
Eureka	1.28	1.05	5.09	0.53	7.95	----
Klamath City	2.95	6.92	5.87	0.31	16.05	1.05
Orick Prairie Creek Park	1.48	4.69	11.60	1.60	19.37	----
Klamath drainage						
Etna	1.58	2.99	1.79	0.05	6.41	0.29
Fort Jones	1.62	2.33	1.63	0.02	5.60	0.31
Happy Camp R. S.	2.68	4.93	3.44	0.29	11.34	0.35
Montague AP	0.24	0.57	0.88	0.00	1.69	0.24
Trinity drainage						
Hoopa	3.42	3.68	1.46	0.38	8.94	0.40
Hyampom	2.28	3.45	2.33	0.20	8.26	0.32
Trinity Center	2.16	4.59	2.86	0.00	9.61	0.43
Weaverville	1.81	2.82	2.02	0.03	6.68	0.30
Smith drainage						
Elk Valley	3.85	5.50	6.60	1.10	17.05	----
Gasquet R. S.	9.09	10.35	2.09	0.27	21.80	----

The air mass producing the storm was of polar Pacific origin; and radiosonde ascents made from the Weather Bureau Station at Medford show that it was near saturation at all levels below 22,000 feet during the period of heavy rain. On October 26 and 27, rainfall was associated with the passage of cold type occluded fronts from two successive deep storm centers. After passing over southwestern Oregon the second cold front became semi-stationary over northern California. This front lay oriented northeast-southwest, parallel to a strong deep flow of polar Pacific air. From the night of the 27th until the morning of the 29th, fast-moving waves developed on and moved up this front, causing alternating warm and cold fronts over southwestern Oregon. At least three such waves passed over the area; this persisting series of waves greatly intensified the rainfall potential. An isohyetal map for the four-day storm rainfall developed from isopercentuals of the storm rainfall applied to the normal annual isohyets, is attached.

Watershed Conditions

Soil and rock formations vary greatly over the area hardest hit by the storm. In the Illinois River watershed there are great areas of serpentine exposures with thin soils and scant cover. In the South Umpqua watershed there are deeply weathered, highly erodible granodiorites in addition to the serpentine formations. To the north, in the Willamette drainage, the watersheds lie on basaltic and andesitic formations; and have deeper and less readily erodible soils. Coastal watersheds from the Coquille north occupy areas of old sandstones and shales with medium-textured soils. South from the Coquille the watersheds are similar to the South Umpqua, with serpentine and granodiorite. The Upper Rogue River watershed occupies recent volcanic formations, with large areas of deep, light, pumice soil.

Cover types vary from the dense coastal rain-forests to the open ponderosa-pine forests and the brushfields of the Siskiyous. Because of the variation in rock formations and soils, the cover density is often poor. Many watershed slopes have shallow rocky soils, and cannot support dense vegetation. A generalized forest type map is attached.

Although logging operations and wildfires have altered the hydrologic characteristics of many watersheds, their exact contribution to the total flood is not known. About seven percent of the area of nine major watersheds observed within the flood zone has been cutover or burned within the past decade. The Umpqua watershed, which produced the biggest flood, has less than this percent of its mountain area so treated. The Illinois watershed has had only five percent of its area recently logged or burned. A larger proportion of the Coquille watershed has been affected; but most of the denudation occurred earlier and the cover is now generally fair.

Forest Survey "forest type" maps of these watersheds show that the forest cover on the Applegate and Illinois drainages is in the poorest condition. About thirty percent of the Applegate has been burned or logged, some of the upper country has been heavily grazed, and perhaps fifteen percent of the area lies on serpentine. The Illinois drainage has the greatest extent of serpentine, but except for the poor cover on such areas appears to be in fairly good condition. The upper Rogue drainage has from twenty to thirty percent of its area in poor cover; from burning, or from logging, or because of rock outcrops and thin soils and poor site. In the central part, around Grants Pass, there have been extensive burns. Both the North and South Umpqua drainages support good stands in the upper areas, though there have been a few burns in the South Umpqua. The lower portions of the watersheds of the smaller tributaries to the Umpqua, such as Myrtle Creek, Deer Creek, and Sutherlin Creek--streams which caused serious flood damage--are largely cultivated, pastured, or covered with a sparse oak-woodland type.

Along roads and skid trails, soil losses by cutbank slumping and ditch and fill-slope erosion were common during the storm period. Much of the road damage was caused by such soil movement. Long after flood peaks had passed, turbidity in the streams was maintained by the drainage of muddy waters from roads churned by heavy trucks. Even on abandoned roads, erosion losses were severe where no provisions had been made for drainage disposal. Though some logged areas were observed to have eroded considerably, the roads and skid trails appeared to have suffered much more.

Stream channels--as might be expected in the first major storm of the season--contributed tremendous quantities of debris to the floods. Heavy debris flows in Coal Creek (15 sq. mi.) and Elk Creek (2 sq. mi.), tributary to the Coquille, washed out bridges. About twenty percent of the watershed area of these two streams has been logged recently. Three years ago, a similar debris flow in Coal Creek washed out one of the bridges. Along major streams, bank-caving caused loss of valuable farmland and added to the sediment loads of the swollen rivers. Unprotected road fills were undercut and washed out, and added to the muddy flow. For the most part, channel capacity was insufficient to carry the heavy runoff, and stream-side erosion was extensive.

Analysis of cover conditions as given by Forest Survey data for the Umpqua and Coquille tributaries show that effectiveness of cover--based on considerations of age and stocking--in controlling runoff and erosion was lowest in those streams which caused most trouble. This lowered effectiveness of cover is in large part related to the considerable denudation (by fire and logging) which occurred over the preceding thirty years. The Cow Creek--with cover rated only two-thirds effective--and the Coquille River watersheds--rated even lower, though the cover now appears fair--have suffered such denudation over one-fifth to one-third of their area.

Summary and Conclusions

The floods at the end of October in southwestern Oregon and northwestern California resulted from long-continued heavy rainfall produced by unusual meteorological conditions. Falling on near-saturated watersheds, the heavy rain brought streams up rapidly to full flood; some to flood peaks greater than any previously experienced. Because of the small amount of storage space available in the soil, much of the rainfall became stream flow almost immediately. With deeper soils and better natural stands of cover vegetation, severity of the floods might have been less; but there would have been floods in any case under the extreme rainfall conditions experienced.

Evidence regarding the effects of land use and treatment on the floods pertains largely to sediment. Although a major portion of the sediment and debris load carried by the streams at peak may have been derived from channel debris and the extensive erosion of streambanks, a not inconsiderable amount was contributed from roads and skid trails and grazing areas. Numerous examples were observed of erosion aggravated by misuse of the land. Though overgrazed areas and those severely disturbed by logging are of limited extent, their contribution to stream sediment loads is disproportionately large. The photographs following show some of these examples, most of which are concerned with roads and skid trails. These photographs were taken the summer before the flood; and the areas shown are probably in even worse condition now after the recent heavy rains.

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Fill-slope erosion from improper road drainage, Applegate watershed, Rogue River N. F.

Road gullied because of insufficient drainage control. Cow Creek, Umpqua N. F.

Fill-slope erosion from improper road drainage, Applegate watershed, Rogue River N. F.

Road gullied because of insufficient drainage control. Cow Creek, Umpqua N. F.

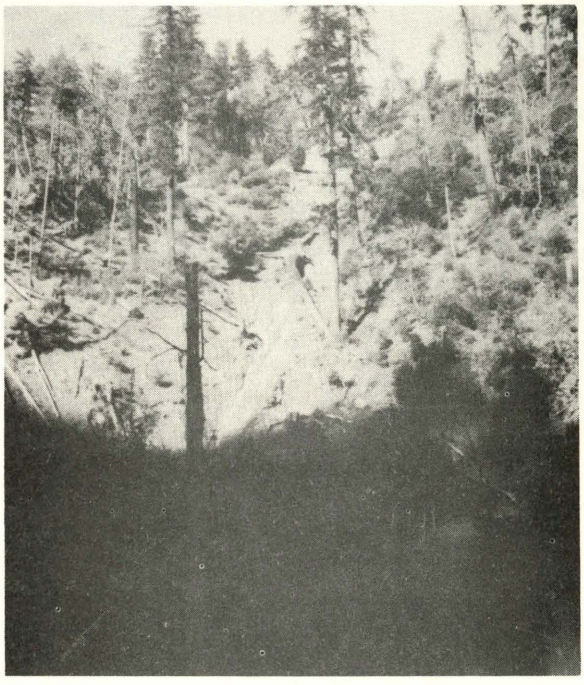
Gullied skid trail, Johnson Creek logging, Siskiyou N. F.

Gullied skid trail in rotten granodiorite, Cow Creek, South Umpqua drainage, Umpqua N. F.

Severely eroded sheep-grazing area, head of Longhorn Creek, Rogue River N. F.

Close-up of eroded grazing area, Rogue River N. F.

Thin cover on serpentine area, Siskiyou N. F.

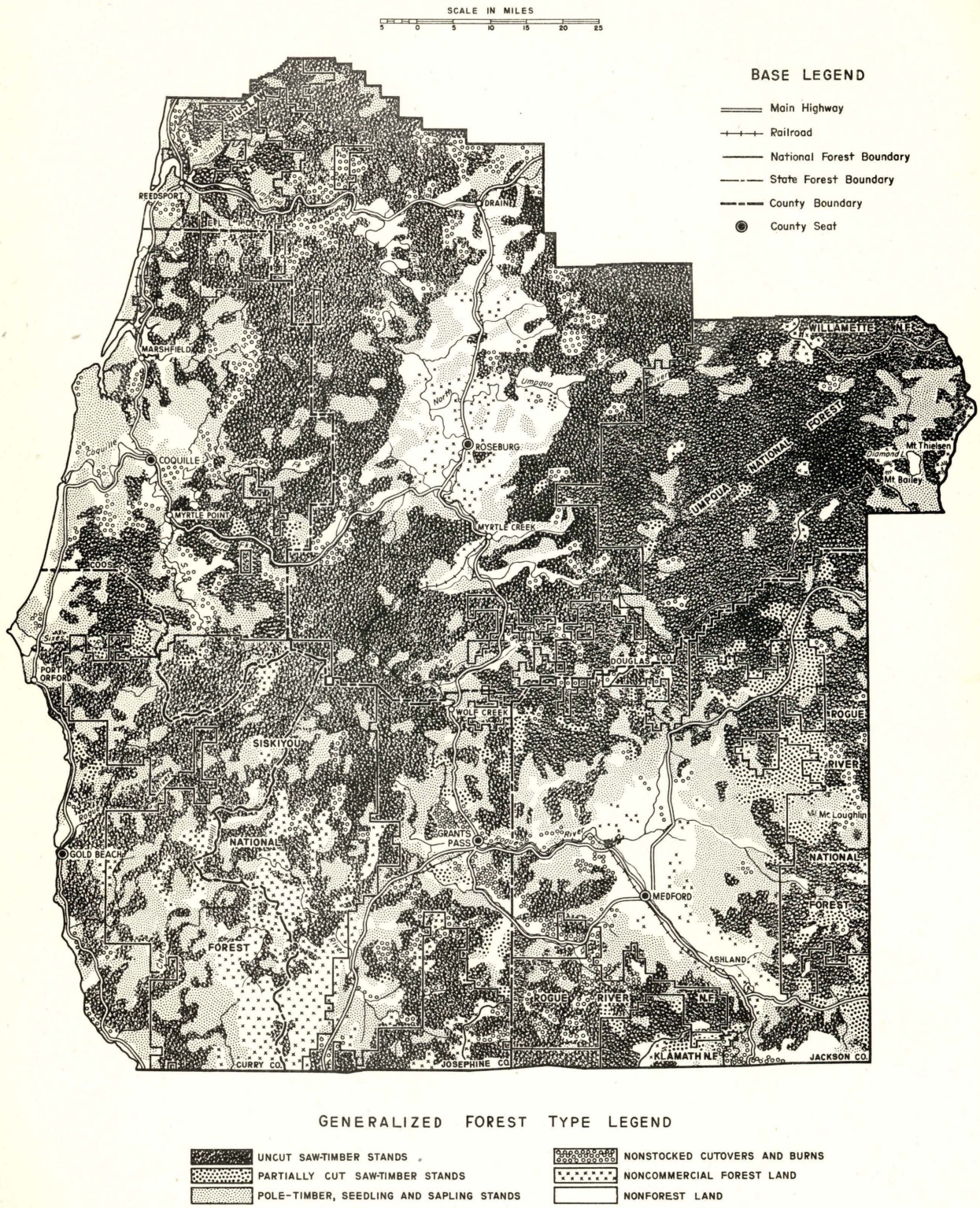


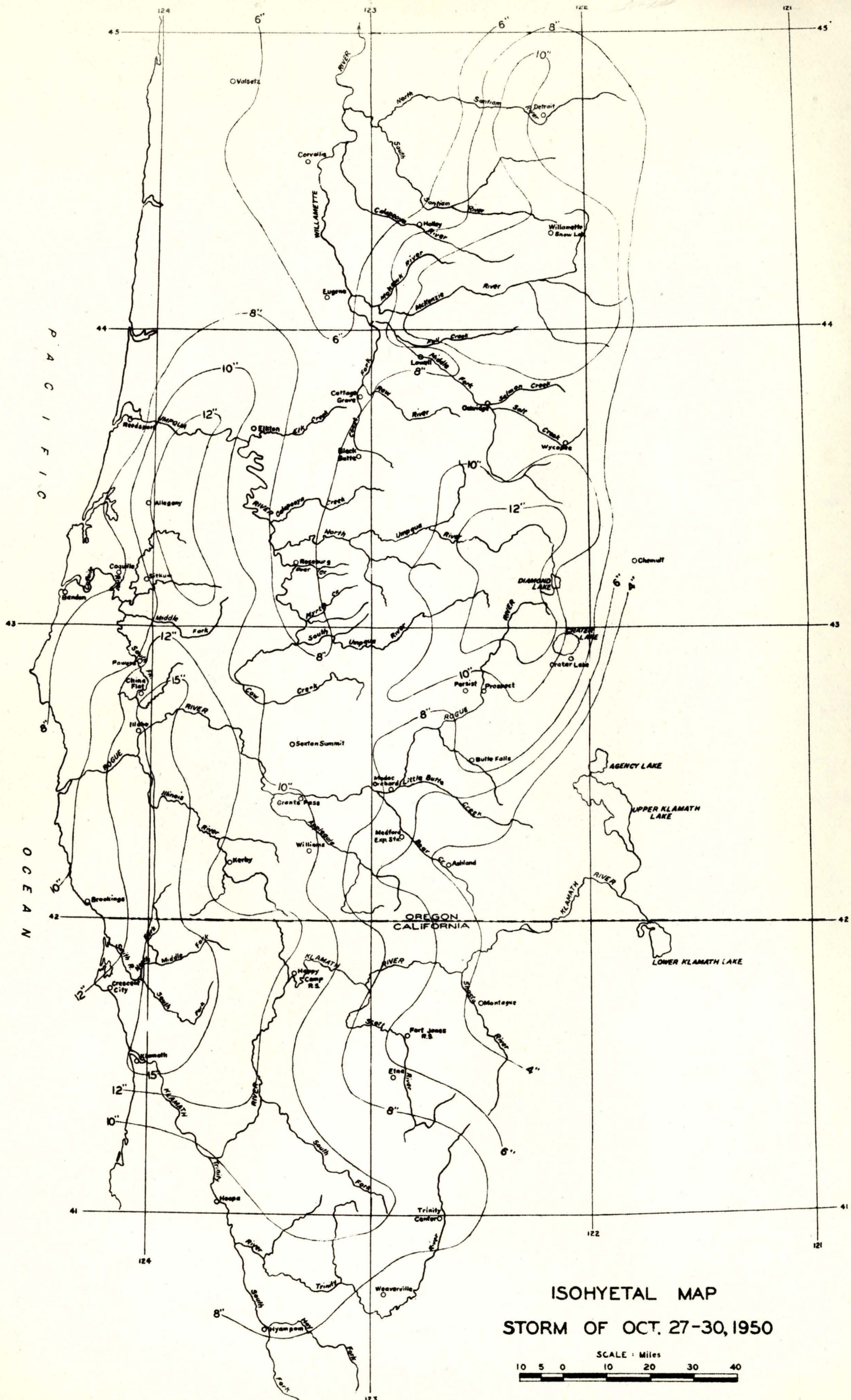
Severe erosion on steep logged slope,
South Fork Coquille

OUTLINE MAP OF SOUTHWEST OREGON UNIT

SHOWING GENERALIZED FOREST TYPES

1948





ISOHYETAL MAP

STORM OF OCT. 27-30, 1950

SCALE : Miles
10 5 0 10 20 30 40